REMARKS

The present application is a divisional of USSN 10/171,132, filed June 13, 2002, now US Patent 6,656,292, issued December 2, 2003. Claims 1-19, which are currently pending in the instant application, were cancelled without prejudice during the prosecution of the earlier '132 application as being directed to a non-elected invention. It is respectfully noted that claims 20-22 in the present application, which are related to claims 1-2 of the issued '292 counterpart, were cancelled by virtue of the Division Application Transmittal Form (PTO Form 3.54) under which the present application was submitted. In addition, the cancellation of claims 20-22 was expressly confirmed by way of a Preliminary Amendment dated December 2, 2003, and submitted contemporaneously with the present filing.

The Examiner's indication of allowable subject matter as delineated by claims 6 and 13 is noted with appreciation.

In order to emphasize the patentable distinctions of applicants' contribution to the art, claims 1, 8, and 17 have been amended to incorporate the limitations of claims 2, 9, and 18 which formerly depended on base claims 1, 8, and 17, respectively. As amended, claim 1 recites a method for the manufacture of heat exchangers and apparatuses having brazed parts, in which the brazed parts are conditioned subsequent to brazing by exposure to an elevated temperature in an oxygen-containing atmosphere for a time sufficient to substantially reduce the amount of nickel leaching into water or other fluids contacting the brazed joint of the brazed assembly. Claim 8 now calls for a method for joining two or more metal parts, the method including a step of conditioning the brazed parts by exposing the brazed joint to

an elevated temperature, in an oxygen-containing atmosphere, for a sufficient time to substantially reduce the amount of nickel leaching into water or other fluids contacting the brazed joint in the brazed assembly. Amended claim 17 delineates a heat exchanger produced by a brazing process that includes a step for conditioning the brazed parts by exposing the brazed joint to an elevated temperature, in an oxygen-containing atmosphere, for a sufficient time to substantially reduce the amount of nickel leaching into water or other fluids contacting the brazed joints of the brazed assembly. Claim 8 has also been amended, for the sake of clarity and consistency with claims 10-14 dependent thereon, by replacement of the word "process" by the word "method." For the sake of clarity, claims 2, 9, and 18 have been cancelled, their features having been subsumed in claims 1, 8, and 17, from which they formerly depended. Claims 3, 4 and 6 have been amended, for the sake of clarity, to depend from claim 1, instead of from now-cancelled claim 2. Claims 10, 11, and 13 have been amended, for the sake of clarity, to depend from claim 8, instead of from now-cancelled claim 9.

In order to emphasize the patentable distinctions of applicants' contribution to the art, claim 16 has been rewritten in independent form, and now includes the features of base claim 15 on which it formerly depended. As amended, claim 16 recites a heat exchanger, comprising at least one joint brazed with an iron/chromium brazing filler metal consisting essentially of a composition having the formula $Fe_aCr_bCo_cNi_dMo_eW_fB_gSi_h$ wherein the subscripts "a", "b", "c", "d", "e", "f", "g", and "h" are in atom percent and wherein, "b" ranges from about 5 to 20, "c" ranges from 0 to

about 30, "d" ranges from 0 to about 20, "e" ranges from 0 to about 5, "f" ranges from 0 to about 5, "g ranges from about 8 to 15, "h" ranges from about 8 to 15, and the sum "a"+"b"+"c"+"d"+"e"+"f"+"g"+"h"=100, the balance being incidental impurities present in an amount up to about 1 percent by weight of the total composition. For the sake of clarity, claim 15 has been cancelled.

New claims 23-25 have been added to provide adequate coverage for applicants' contribution to the art. Claim 23 recites a method for the manufacture of heat exchangers and apparatuses having brazed parts, comprising the steps of: (i) juxtaposing at least two parts to define one or more joints therebetween; (ii) supplying to the joints an iron/chromium brazing filler metal; (iii) heating the juxtaposed parts and the brazing filler metal under appropriate conditions in order to melt the brazing filler metal; and (iv) cooling the juxtaposed parts and the brazing filler metal to produce a solid brazed joint of a brazed assembly. The iron/chromium brazing filler metal consists essentially of a composition having the formula $Fe_aCr_bCo_cNi_dMo_eW_fB_gSi_h$ wherein the subscripts "a", "b", "c", "d", "e", "f", "g", and "h" are in atom percent and wherein, "b" ranges from about 5 to 10, "c" ranges from 0 to about 10, "d" ranges from 0 to about 10, "e" ranges from 0 to about 3, "f" ranges from 0 to about 3, "g" ranges from about 8 to 15, "h" ranges from about 8 to 15, the sum "g"+"h" ranges from about 18 to 25, and the sum "a"+"b"+"c"+"d"+"e"+"f"+"g"+"h"=100, the balance being incidental impurities present in an amount up to about 1 percent by weight of the total composition. The aforesaid brazing filler metal and compositional formula are set forth in claim 1 of US Patent

6,656,292, a divisional counterpart of the instant application. New claim 24 depends from claim 23 and calls for the brazing filler metal to be in the form of a homogeneous, ductile ribbon, as also delineated by claim 2 of the aforesaid '292 patent. New claim 25 depends from claim 23 and requires the method to further include a conditioning step.

Support for the foregoing amendments and for newly added claims 23-25 is found in the specification, e.g. at page 12, lines 5-16 and page 16, lines 10-21. Consequently, no new matter has been added.

The specification has been amended to expressly include reference to US Patent 6,656,292, a divisional counterpart of the present application.

The Abstract has been rewritten to describe the disclosure in less than 150 words.

The present invention, as defined by claims 1, 3-8, 10-14, 16-17, 19, and 23-25, is directed to a method and a process for joining a plurality of metallic parts by brazing to form a manufactured assembly. Assemblies manufactured in accordance with the claimed process and method advantageously exhibit a reduced propensity for nickel to be leached into water or other liquid passing through the assembly. In recent years, a number of concerns have been raised about possible adverse health effects resulting from exposure to Ni in drinking water, juices, liquids, and foodstuffs ingested by humans and animals. The formulation and packaging of these items for distribution frequently entails passing them through heat exchangers and similar items. These implements, and ancillary structures such as piping, are most often fabricated using stainless steel alloys, in order to make them corrosion resistant, durable, attractive, and easy to operate and sanitize. One widely used means of joining stainless steel parts is high temperature

brazing using a variety of brazing filler materials. However, easily detectable amounts of Ni are seen in liquids commonly encountered in food processing that have passed through conventionally brazed joints in such stainless steel structures.

The reduction in Ni leaching afforded by brazing operations carried out in accordance with the teaching of the present invention, as set forth in claims 1, 3-8, 10-14, 16-17, 19, and 23-25,, is thus especially advantageous. Heat exchangers and similar devices used in the processing and packaging of beverages and other foodstuffs intended for human consumption exhibit a marked reduction for pickup of leached Ni.

Objection has been raised to the abstract because of length. In accordance with MPEP 608.01(b), the original abstract has been cancelled and a substitute abstract having less than 150 words is provided herewith. It is respectfully submitted that the substitute abstract complies with the requirements delineated in MPEP 608.01(b).

Accordingly, withdrawal of the objection to the abstract is respectfully requested.

Claim 21 has been rejected under 35 USC 101 as claiming the same invention as that of claim 1 of prior US Patent No. 6,656,292. As set forth hereinabove, it is respectfully submitted that claims 20-22 of the instant application were cancelled at the time of the initial filing. Applicants submit that claim 21, having already been cancelled, should not be subject to a statutory double patenting rejection.

Accordingly, withdrawal of the rejection under 35 USC 101 of claim 21 as claiming the same invention as claim 1 of US Patent No. 6,656,292 is respectfully requested.

Claims 20 and 22 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 2 of US Patent 6,656,292. As set forth hereinabove in connection with the statutory double-patenting rejection of claim 21, it is submitted that claims 20-22 of the instant application were cancelled at the time of the initial filing. Applicants thus submit that claims 20 and 22, having already been cancelled, should not be subject to an obviousness-type double patenting rejection. Applicants further submit that no terminal disclaimer over US Patent 6,656,292 should be required in the present application, which was filed to obtain coverage for an invention deemed a separate invention during the prosecution of the '292 patent by way of a restriction requirement.

Accordingly, withdrawal of the rejection of claim 21 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 2 of US Patent 6,656,292 is respectfully requested.

Claims 1, 8, 15, and 17 were rejected under 35 USC 102(b) as being anticipated by US Patent 4,410,604 to Pohlman et al. In view of the cancellation of claim 15, the rejection will discussed with respect to amended claims 1, 8, and 17, which remain pending.

Pohlman et al, discloses an economical brazing alloy including high amounts of iron and an assembly brazed with such a brazing alloy.

The courts, including the Court of Appeals for the Federal Circuit, have consistently held that a prior art reference must disclose every element of a claim for the reference to constitute an

anticipation under 35 U.S.C. §102. ["A prior art reference anticipates a claim only if the reference discloses, either expressly or inherently, every limitation of the claim. . . . '[A]bsence from the reference of any claimed element negates anticipation.'" ***Row v. Dror***, 42 USPQ 2d 1550, 1553 (Fed. Cir. 1997) (quoting ***Kloster Speedsteel AB v. Crucible, Inc.***, 230 USPQ 81, 84 (Fed. Cir. 1986). "Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration." ***W.L. Gore & Assocs. v. Garlock, Inc.***, 220 USPQ 303, 313 (Fed. Cir. 1983), ***cert. denied***, 469 U.S. 851 (1984).] Moreover, the Board of Appeals has ruled that "when an examiner relies on inherency, it is incumbent on the examiner to point to the "page and line" of the prior art which justifies an inherency theory." ***Ex parte Schricker***, 56 USPQ 2d 1723, 1725 (B.P.A.I. 2000) (unpublished). See also MPEP 2112.

Applicants respectfully submit that the Examiner has failed to meet the burden required under these decisions to establish a *prima facie* case of anticipation of claims 1, 8, and 17. In particular, it is submitted that claims 1, 8, and 17, as amended, all recite a conditioning step (e) carried out subsequent to the formation of the brazed joint. Significantly, there is no disclosure or suggestion by Pohlman et al. of any brazing process in which a conditioning step is carried out subsequent to the formation of the brazed joint, as required by present claims 1, 8, and 17. Applicants maintain that the inclusion of the conditioning step results in the reduction of Ni leaching set forth in present claims 1, 8, and 17. Absent any disclosure of such a step in Pohlman et al. or any showing that a person of ordinary skill would understand that such a step is inherently

present in any process disclosed by Pohlman et al., applicants submit that a rejection of claims 1, 8, and 17 under 35 USC 102 is not proper.

Accordingly, reconsideration of the rejection of claims 1, 8, 15, and 17 under 35 USC 102(b) as being anticipated by US Patent 4,410,604 to Pohlman et al. is respectfully requested.

Claims 2-5, 9-12, and 18 were rejected under 35 USC 103(a) as being unpatentable over Pohlman et al. in view of US Patent 6,493,936 to Doi et al. In view of the cancellation of claims 2, 9, and 18, this rejection will be addressed with respect to remaining claims 3-5, and 10-12, as amended.

Doi et al. discloses method of making a steam turbine blade of Ti-base alloy comprising a duplex $\alpha+\beta$ type phase microstructure, along with a steam turbine comprising such a blade, and a steam turbine power generating plant employing such turbines. The blade is said to have blade and dovetail portions, the dovetail portion having a room-temperature tensile strength greater than that of the blade portion. Significantly, Al is said to be an essential element of the $\alpha+\beta$ type Ti-base alloy used in forming the Doi et al. turbine blade, and Sn and V are said to be important elements. See col. 4, lines 9-10, 18-20, and 36-38.

Recognizing that Pohlman et al. fails to disclose any brazing process including a conditioning step, the Examiner has pointed to Doi et al., which is alleged to teach a method of heat-treating a structure after brazing to improve material properties.

In particular, teaching at col. 11, lines 40-58 is cited. The Examiner contends that

it would have been obvious to one of ordinary skill in the art at the time of the present invention to employ a conditioning step after brazing to strengthen the parent metals and thereby improve the high temperature service of the heat exchanger while maintaining low brazing temperatures and costs.

Applicants respectfully submit that the Examiner has not established that: (i) the combination of Pohlman et al. and Doi et al. discloses or suggests every feature of applicants' claims or (ii) one of ordinary skill would have been motivated to make the combination of references proposed.

Significantly, the disclosure of metal joining process in the Doi et al. patent is restricted to a very few instances, e.g. col. 11, lines 33-35 and 50-53; col. 23, lines 58-60; and col. 25, lines 8-11. These passages provide only minimal detail of joining processes, which are variously characterized as welding, brazing, or electron beam welding. Furthermore, only the welding operations, which are set forth in the col. 23 and col. 25 passages, involve any Fe-base filler material. There is no disclosure of brazing using any Fe-base filler material. Fe-base material is disclosed only in connection with welding, and even that material does not have any composition delineated by the composition formulas provided in applicants' claims. Doi et al. clearly contemplates an electric-arc welding process, as evidenced by the recitation of current and voltage at col. 23, line 59. In addition, the Doi et al. disclosure is devoid of any reference to any conditioning step requiring the oxygen-containing atmosphere recited by amended claims 1 and 8, on which present claims 3-5 and 10-12, respectively, depend. Applicants'

oxygen-containing atmosphere feature is also recited in present claims 17 and 25. Neither Pohlman et al. nor Doi et al. evidences any recognition of the problem of Ni leaching in heat exchangers. Neither reference provides any suggestion of a process whereby Ni leaching is reduced, even less a suggestion that a conditioning process such as that of applicants could accomplish such an effect. Applicants thus submit that even the combination of Pohlman et al. and Doi et al. fails to disclose or suggest every feature of amended claims 3-5 and 10-12.

Still further, applicants traverse the Examiner's motivation to combine the references in the manner proposed.

Doi et al. sets forth in significant detail the necessity of an aging treatment that is specific to the Ti-base alloy employed in turbine blades. In particular, exposure to high temperatures, such as those required for most welding or brazing operations, solutionizes the Ti-Al-V-Sn base alloy used (col. 1, lines 47-53). The alloy then must be forcibly cooled to produce a refined and homogenized $\alpha + \alpha'$-martensite structure providing high ductility and high toughness (col. 2, lines 38-44). In order to recover adequate mechanical strength, the alloy must subsequently be given a lower temperature aging treatment, whereby the α'-martensite is decomposed to form a two-phase $\alpha + \beta$ duplex microstructure (col. 2, lines 65-68). Applicants respectfully submit that such a treatment is clearly alloy-specific, and that one of ordinary skill in the metallurgical arts would find no motivation to combine any teaching of an aging treatment in Doi et al. with the Pohlman et al. disclosure, in connection with a brazing process carried out on workpieces

made with other alloys, which are not known to require any aging treatment to achieve satisfactory mechanical performance of the base metal in the workpieces. It is also submitted that one of ordinary skill in metallurgical arts would have no expectation that the Doi et al. aging treatment would be effective and successful in strengthening parent metals such as the stainless steel set forth by applicants. Such a lack of expectation of success is submitted to negate the Examiner's alleged motivation for the combination of Pohlman et al. and Doi et al.

Applicants also maintain that one of ordinary skill in the art would in fact be motivated in light of Doi et al. to avoid any aging step not needed to effect a desired precipitation hardening (col. 3, line 48 of Doi et al.) of a particular alloy, since any such step would present a needless manufacturing complication, inefficiency and expense and might actually degrade a brazed object.

Applicants further submit that the functions of the aging treatment of Doi et al. and the present conditioning treatment are entirely different. The Doi et al. aging treatment is appointed to effect improved mechanical properties of the workpieces themselves that would otherwise have been compromised by a joining process such as brazing. Applicants' conditioning step, on the other hand, addresses chemical behavior of material, particularly that material in the vicinity of the brazement. Applicants are unaware of any disclosure of the problem of Ni leaching in stainless steel structures apart from brazing. Without being bound by any theory, applicants believe that the present conditioning treatment carried out in an oxygen-containing atmosphere results in

oxidation of material in the vicinity of the brazement. This oxidation is believed to be sufficient to chemically or mechanically bind Ni that otherwise could be leached into fluid passing through a heat exchanger brazed in accordance with the present invention. There is submitted to be no recognition in Doi et al. of any chemical benefit arising from oxidation or otherwise as a consequence of the aging processes provided in the Doi et al. disclosure. Absent any such recognition, it is submitted that there is no motivation for the combination made.

Accordingly, reconsideration of the rejection of claims 2-5, 9-12, and 18 under 35 USC 103(a) as being unpatentable over Pohlman et al. in view of Doi et al. is respectfully requested.

Claims 7, 14, 18, and 19 were rejected under 35 USC 103(a) as being unpatentable over Pohlman et al. in view of US Patent 4,576,873 to Bose et al. In view of the cancellation of claim 18, this rejection will be addressed with respect to remaining claims 7, 14, and 19, as amended.

Bose et al. discloses a homogeneous, ductile iron-based hardfacing foil having a composition consisting essentially of about 0 to about 25 atom percent cobalt, 0 to about 30 atom percent nickel, 0 to about 30 atom percent chromium, 0 to about 5 atom percent tungsten, 0 to about 4 atom percent molybdenum, about 2 to about 25 atom percent boron, 0 to about 15 atom percent silicon, and 0 to about 5 atom percent carbon, the balance being iron and incidental impurities, with the proviso that the total of iron, cobalt, nickel, chromium, tungsten, and molybdenum ranges from about 70 to 88 atom

percent and the total of boron, silicon, and carbon ranges from about 12 to 30 atom percent.

The Examiner has pointed to the disclosure in Bose et al. of Fe-base filler metal at col. 3, lines 10-53 and col. 4, lines 16-32. She has also cited disclosure of a homogeneous, ductile ribbon at col. 2, lines 65-68 and placement of such foil on a part with subsequent heating and cooling at col. 4, lines 32-49 and col. 5, lines 12-19.

It is well established that mere overlap of a compositional range taught in a prior art reference and a claimed range *per se* is not dispositive of anticipation or obviousness (MPEP 2131.03). In the present instance, it is respectfully submitted that no species disclosed or suggested by Bose et al. falls within the compositional limits recited by amended claims 7, 14, or 19. The Examiner has not pointed to any such species. Moreover, Bose et al. is directed to a hardfacing alloy, and not to a brazing filler metal.

Applicants further submit that there is no recognition in Bose et al., or elsewhere in the prior art, that a brazing filler metal falling within the compositional formula delineated by present claims 7, 14, and 19 can be used in forming a brazed joint. More specifically, there is no suggestion in Bose et al. of a brazement joining stainless steel workpieces, for example in the construction of heat exchanges with a markedly reduced propensity for leaching nickel, that in some cases is as much as an 85% reduction (see, e.g., page 17, line 5). This finding, evidenced by applicants' examples 1 – 4, is clearly surprising and unexpected. Like the other references applied, Bose et al. does not disclose or suggest the present post-brazing conditioning step in an oxygen-containing

atmosphere. In addition, Bose et al. does not provide any disclosure or suggestion concerning nickel leaching from brazed joints, let alone any ameliorative role played by the composition of the brazing filler metal used and the conditioning step. The Examiner has not provided any motivation within Bose et al. or elsewhere that points to such a role. As a result, one of ordinary skill would find no guidance whatsoever within Bose et al. regarding selection of brazing foil composition, let alone teaching to select applicants' claimed alloy in combination with a post-brazing conditioning step in joining the components of heat exchangers to reduce nickel leaching. Moreover, applicants teach that the composition delineated by amended claims 7, 14, and 19 advantageously is readily quenched into a highly ductile metal strip and exhibits low liquidus temperatures (e.g., page 12, lines 12 – 13). The combination of ductility, low liquidus temperature, and the reduction of nickel leaching that results from the brazing of joints in accordance with the method of amended claims 7, 14, and 19 is submitted to rebut any *prima facie* obviousness of amended claims 7, 14, and 19 over Bose et al.

Accordingly, reconsideration of the rejection of claims 7, 14, 18, and 19 under 35 USC 103(a) as being unpatentable over Pohlman et al. in view of Bose et al. is respectfully requested.

The Examiner has made of record US Patent Publication US2004/0056074 to Sjodin and US Patent 4,402,742 to Pattanik, as being pertinent to applicants' disclosure, but has not relied on these references. It is respectfully submitted that these references

do not disclose or suggest the subject matter of claims 1, 3-8, 10-14, 16-17, 19, and 23-25, as amended.

In view of the amendment to claims 1, 3, 4, 8, 10, 11, 13, 16, and 17; the cancellation of claims 2, 9, 15, 18; the amendment to the specification; the amendment to the abstract; and the foregoing remarks, it is respectfully submitted that the present application has been placed in allowable condition. Reconsideration of the objection to the abstract and the rejections of claims 1 – 22, and allowance of amended claims 1, 3-8, 10-14, 16-17, and 19, together with new claims 23 – 25, are, therefore, earnestly solicited.

Respectfully submitted,

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